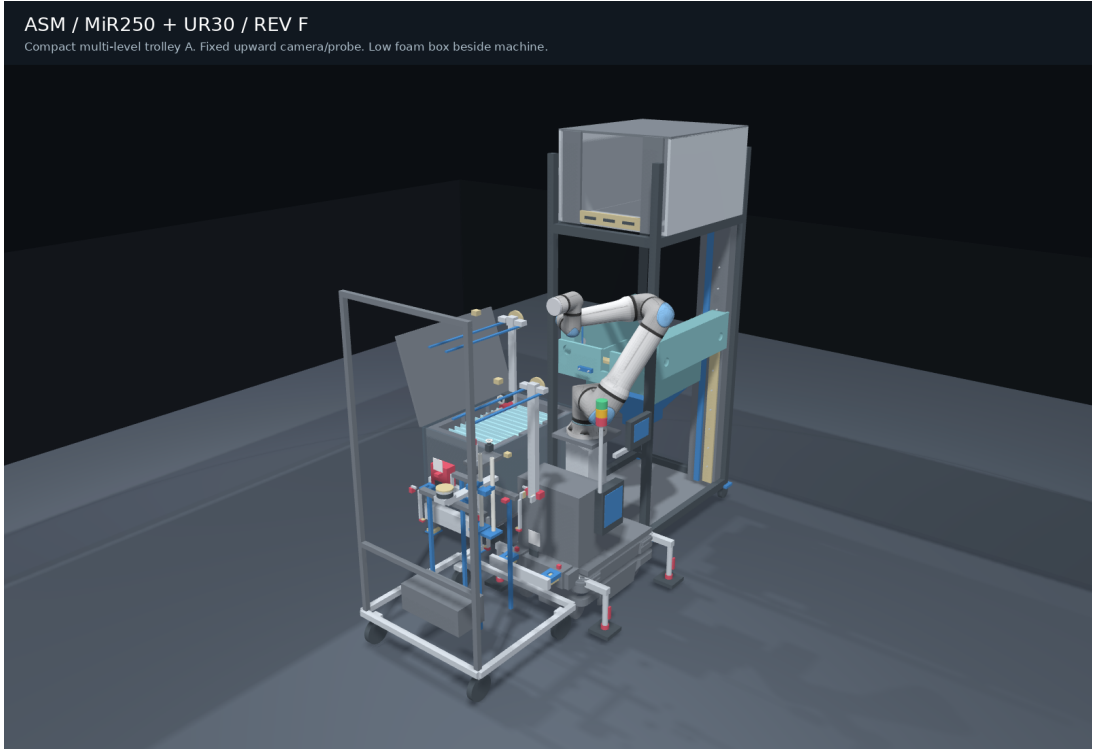




Compact trolley installation concept

Permanent UR30 / installation A / optional inspection B and container carrier C

Rev F adds a rigid paired trolley interface, machine-shaped POC with automatic tool exchange, and an optional floor-supported container carrier. The installation tools remain on a compact multi-level trolley. The robot accesses upper tools from the side and the chamber carrier at the lower open level. A custom lift/latch retains the trolley for travel; the UR30 remains on MiR250.



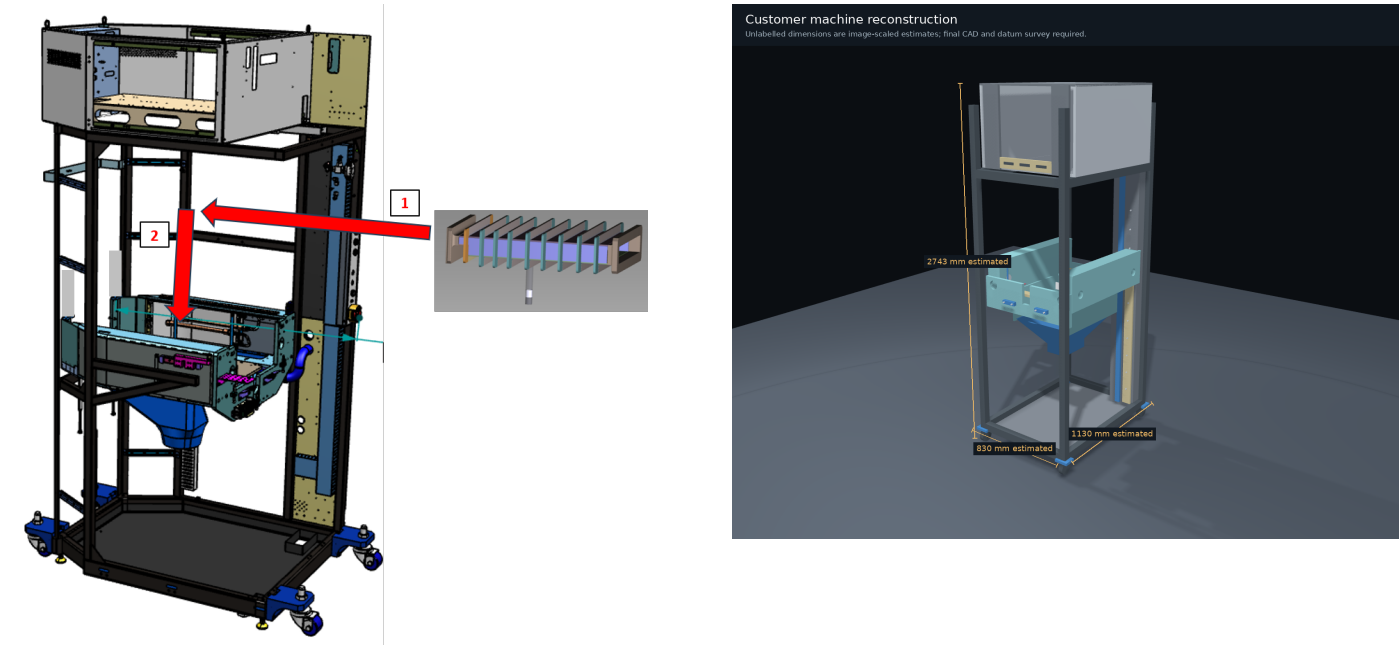
Assembly	Function
Trolley A	Camera/probe T1, load-sensing carrier T2, fixed upward station and drawer. Optional T3 and guiding fixtures.
Fixed upward station	Camera and probe do not scan or traverse. The robot moves the retained chamber to present each hole and bottom surface.
Trolley B option	Camera/probe/laser tool T4 for dimensional and AI defect inspection after an exchange at the docking bays.
Low source box	Foam container with top lid and 150mm transport casters. A separate holder and floor stands unload the wheels for pickup.

The rack frame is nominally 935mm wide, 835mm deep and 2090mm high. Tool, metrology and receiver overhangs enlarge its working envelope. Robot sweep, lid, supports, travel turns, bays and safeguarding require separate floor-space allocation. This is a compact candidate, not a global minimum-area proof.



Customer dimensions and model confidence

Customer callouts, image-derived estimates and proposed geometry remain separate



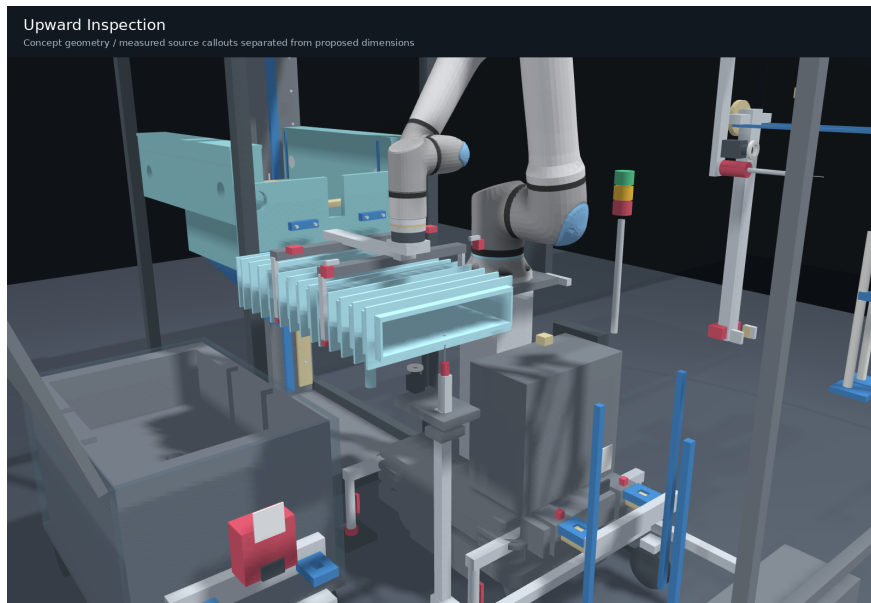
Feature / mm	Evidence and treatment
Type1:759 x490 x159	Customer fin envelope. Body height113; internal opening433 x88.
Tube diameter34; reference355	Customer callouts. Modelled tip -219 from fin-bottom datum; upper datum interpretation requires confirmation.
700 /310 /450 /230	Customer interface spacings and height reference. Mount poses still provisional.
Frame830 x1130 x2743	Image-scale estimate. Nominal seatZ1250; crossbeam undersideZ2100.
Pin diameter8 / hole diameter10	Explicit assumptions. Actual fits and insertion tolerances are missing.
Original embedded STEP	Customer tong and both manual installation guides retained unchanged.

Perspective scaling cannot establish exact hidden dimensions or tolerances. The complete machine and quartz CAD were not supplied. Official UR30 meshes/default kinematics are used; MiR250 is a community reference mesh and is not labelled verified OEM CAD.



Fixed metrology and quartz handling

Camera before contact / tool ownership / bounded alignment



Stage	Required behaviour
T1 registration	Camera views first; low-force touches on approved source surfaces, all three machine pins, three seating-plane points and the parked T2 reference.
Foam extraction	Four shoes enter fin slots and support flat side lands. Confirm retention and load balance. Monitor force/moment versus displacement; excess resistance causes HOLD.
Fixed station	Robot moves chamber over the fixed camera, then around the fixed stylus for bore and bottom-plane touches. Clear stylus and tubulation before large traverses.
Frame comparison	Fit measured hole and pin frames; test pair distances, residuals and uncertainty. Pose correction cannot fix pattern mismatch.
Seating	Enter level, descend slowly, confirm three seats and load transfer, unload pads, then open and withdraw.

No force is applied through the tube. Camera/probe diversity is not automatically safety-rated redundancy. UR30 built-in F/T accuracy 10N is not sufficient evidence of delicate-contact protection. Probe force, external F/T range, bandwidth, threshold and stopping response require actual trials.



Trajectory and sampled mesh audit

Nominal guide-free installation, trolley exchange and optional inspection

Check	Rev F result
Sampled configurations	22,417
Broad-phase object-pair evaluations	278,510,990
Narrow-phase mesh tests	221,261
Maximum joint increment	0.499973 degrees
Fixed upward station drift during metrology	0.000mm
Non-exempt sampled contacts	0

The revised route clears the reconstructed machine posts, upper parked tools, controller, source box, foam slots, fixed stylus, low trolley frame and docking rails. The B-trolley exit is extended before turning. The model includes the concept guarded demonstration zone.

Intended contacts

Only identified assembly mounts, tool-changer mating at alignment, supported parked tools, retained gripper-to-quartz pads, prescribed probe touches, seat handover and aligned lift-capture interfaces are exempted. Other relevant mesh pairs remain checked.

The fixed upward station has no actuation during measurement. Its transform relative to trolley A is constant; chamber motion produces the scan and probe contacts.

Limits: sampled meshes do not prove continuous swept clearance. Final CAD, cables/hoses, tolerances, dynamic deformation, force physics, payload/CG, floor reactions, braking and stopping distance are open. Measured path corrections need a fresh audit. T3 guide installation remains outside these guide-free checks. Separate reports cover the fixed POC and container carrier.



Interchangeable trolley and controls

Proposed lift-capture interface / mobile interlocks / optional inspection



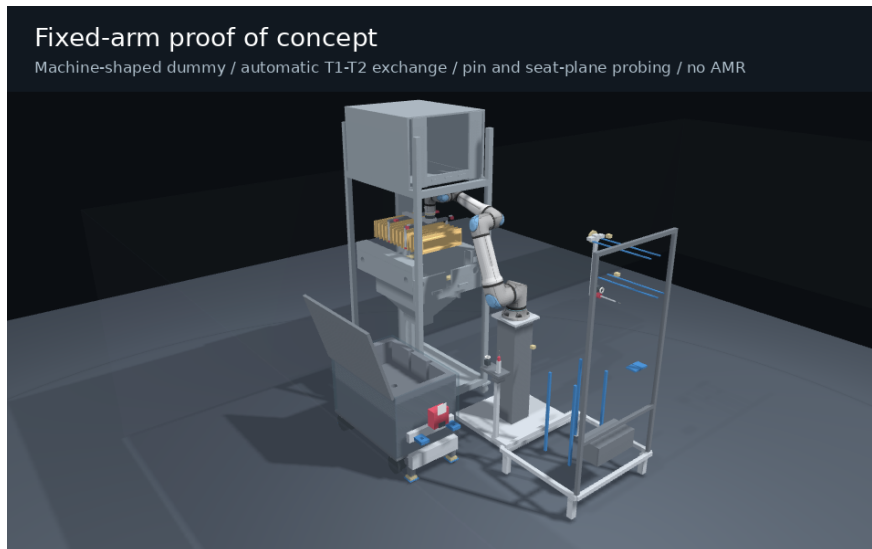
Stow the arm, retain all tools and lift the stabilizer feet before travel. At bayA, confirm support before lowering and releasing the capture. Approach bayB with capture lowered, verify identity, raise and latch, then return. The proposed coupling is yaw-locked in this simulation; an articulated OEM Hook model is not being claimed.

Control	Release requirement
Mobile mounting	Include arm63.5kg, controller12kg, top structure, power, tools and transferred trolley reaction in MiR250250kg top-load/CG checks.
Power	Engineer approved robot AC supply, battery/runtime, charging and service isolation.
Signals	Camera flash, contact light/beep, OK/HOLD/NG stacklight, base controller, pendant and linked PC. These are simulated states.
Inspection	Agree defect classes/data and dimensional criteria. Optical trials select the correct triangulation technology for each surface.
Safeguarding	Validate the complete cell layout, interlocked access, mobile protective fields, stop distances and retained recovery.



Fixed POC and commercial release

Separate POC, base system and selectable options



A fixed-arm POC uses a machine-shaped obstruction dummy with three locating pins and three seating references. Automatic T1 camera/probe and T2 gripper exchange is included, with the same measured approach and retreat corridor. Proposed trials include repeated pick/place, foam resistance and controlled faults. No AMR is required. A printed part cannot reproduce real-quartz fracture, surface damage or cleanroom behaviour.

Package	Budget SGD ex tax
Fixed-arm POC	119,295
Mobile base with trolleyA	625,845
Optional T3 + two guides	22,110
Optional inspection trolleyB	140,085
Optional powered carrierC	78,210

Pricing includes the stated engineering risk allowance and is budgetary pending supplier offers, design freeze and agreed acceptance. POC is additional; no automatic credit is assumed. Detailed internal costing is maintained separately.

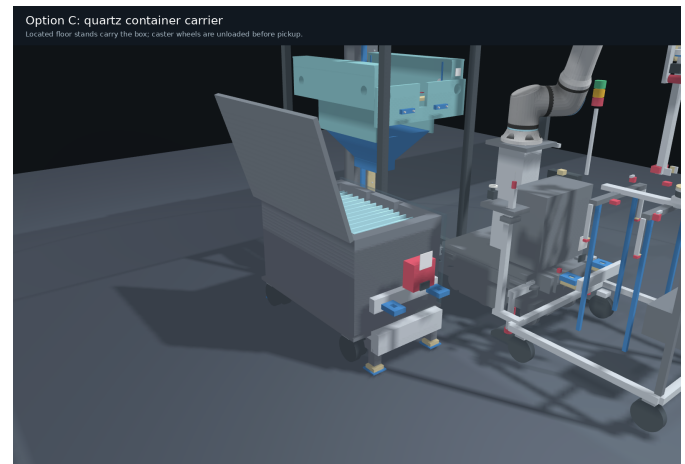
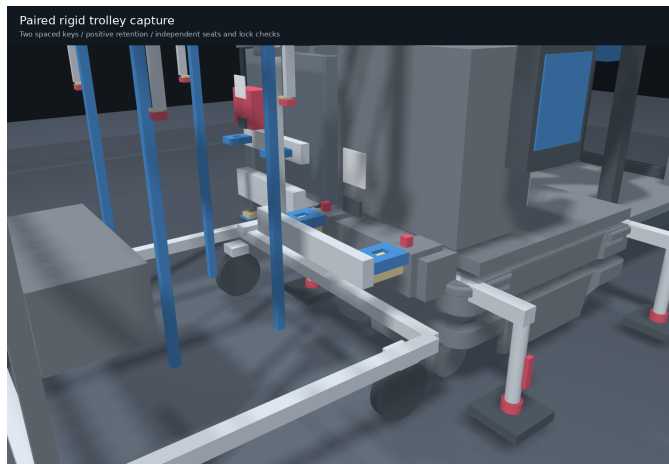
UR30 arm/controller are ISOClass4 and MiR250 offers an optional ISOClass4 configuration. Neither statement qualifies the full mobile assembly to ISO7. Obtain exact configurations and integrated operating acceptance. Exact ASM process and production cycle benefit remain unconfirmed.

Sources: ASM Information for AETEC_20261023.pptx (10slides); official UR30 technical specifications; MiR250 specifications and Hook application pages; Renishaw TP200; detailed public price references in the internal cost workbook. UR geometry commit81f7c9fe003c2f0e02eec5a7253f1b262ad38b61; community MiR commitc08dfad93be53ac12969f0f37a01a2b74b5c1997.



Rigid coupling and carrier C

Mechanical retention / located floor support / one trolley at a time



Design element	Concept and required evidence
Paired coupling	Spaced keys and a wide stiff bridge; retained locking, shear datums and independent seat/lock sensing. Prove stiffness, fatigue, braking and turn loads.
Identity and location	AprilTag/RFID identify the cart. Mechanical datums and latch sensors establish final engagement. Fiducial readings alone cannot authorize handling.
Underlift carrier	Forks enter the structural container underside and clear caster rows. Close lid and retain load during transport; do not load foam or quartz through the forks.
Dock and support	Approach square, locate, deploy jacks, check load and displacement, unload all wheels, then release AMR. Base already includes manual holder/locators; C is an upgrade.
Power loss	Isolated AMR-supplied 24V power while coupled. Brakes or positive mechanical supports retain the load after disconnection. Screw self-locking is not assumed.

Manufacturer references: MiR250 Hook application (AprilTag); SCHUNK NSE3-PH-IOL retained form-fit clamping principle; Nook screw-jack design considerations. These are principle references, not proof of an approved UR30/MiR250/custom-carrier integration.



Software records and expanded POC audit

Diagnostic evidence / controlled recovery / three separately checked scenarios

AETEC / ASM OPERATIONS CONSOLE

REV F SOFTWARE DESIGN • SIMULATED SIGNALS / NO EQUIPMENT CONNECTION

JOB / TROLLEY / READINESS

Job	ASM-POC-001
Recipe	Type 1 / revision F
Selected trolley	A - Installation
Tool	T1 - camera + probe
Dock	Seats + paired locks checked
Support	Stands loaded / wheels clear
Calibration	CAL-DEMO-20261024

CAMERA → PROBE → ALIGN → INSTALL

- 01 Reserve machine / verify identity
- 02 Camera views / safe probe approach
- 03 Measure three pin centres and heights
- 04 Touch three seating-plane references
- 05 Exchange T1 → load-sensing T2
- 06 Pick / fixed upward hole verification
- 07 Level entry / slow seating / unload

FAULT BUFFER

10 seconds before + 20 seconds after
100 Hz synthetic trace - example

Raw points · images · force · support
Reset acknowledges; Start is separate

EVENT JOURNAL / TRACEABLE HANDOVERS

1001	10:22:14.001	TOOL_LATCH_CONFIRMED	T1 / paired checks
1002	10:22:14.510	CAMERA_CAPTURE	Image reference + quality
1003	10:22:15.035	PROBE_POINT_RECORDED	Raw XYZ + stylus + calibration
1004	10:22:15.280	SEATING_PLANE_FIT	Normal + residual + uncertainty
1005	10:22:15.420	FAULT_BUFFER_SAVED	Job / trolley / tool / software IDs

Local durable journal and fault files proposed for production. Browser demo provides local records and JSON/CSV export.

Audited scenario	Samples / non-exempt contacts
Mobile A to B	22,417 / 0
Fixed POC / auto tools	28,575 / 0
Carrier C / underlift	4,501 / 0

Job, part, machine, trolley, tool, calibration and software IDs link camera frames, raw probe points, frame fits and force/support traces. Proposed 100 Hz buffers retain 10s before and 20s after a fault. Persist the event and trace together; a mandatory logging failure inhibits continuation. Reset never restarts motion.

The browser prototype stores a local demo journal and exports JSON/CSV with a synthetic fault buffer. Production durability, clock synchronization, retention, access control and MES interfaces remain implementation work. The nominal collision checks are not force, tolerance or safety validation.